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NATIONAL BUREAU OF STANDARDS-1963-A

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QUARTERLY PROGRESS REPORT
TECHNOLOGY DATA ACQUISITION
CONTRACT N00173-80-C-0014

Submitted to:

Head, Critical Technology
Assessment Office
Naval Research Laboratory (Code 1404)
4555 Overlook Avenue
Washington, D.C. 20375

Submitted by:

DATA SOLUTIONS CORPORATION
2095 Chain Bridge Road
Vienna, Virginia 22180

March 19, 1980

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Management Data (1473) Data

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--    1  OF    1
--    1 - AGENCY ACCESSION NO:   DN080080
--   12 - SUMMARY RECEIPT DATE:  30 NOV  82
--    2 - DATE OF SUMMARY: 01 OCT  82
--    3 - DATE OF PREV. SUMMARY: 15 FEB  82
--    4 - KIND OF SUMMARY: COMPLETED
--    5 - SUMMARY SECURITY IS:   UNCLASSIFIED
--    6 - SECURITY OF WORK:      UNCLASSIFIED
-- 8A1 - DIST. LIMITATION:       UNLIMITED
--   8B - CONTRACTOR ACCESS:     YES
--10A1 - PRIMARY PROGRAM ELEMENT:      0
--10A2 - PRIMARY PROJECT NUMBER:       0
--10A2A - PRIMARY PROJECT AGENCY AND PROGRAM:      0
--10A3 - PRIMARY TASK AREA:     NAVMAT
--10A4 - WORK UNIT NUMBER:       0334-01
--10C1 - CONTRIBUTING PROGRAM ELEMENT (2ND):     95 MISSI
--10C2 - CONTRIBUTING PROJECT NUMBER (2ND): DN/FUNCTION
--10C3 - CONTRIBUTING TASK AREA (2ND):     SUPPT
--   11 - TITLE:     (U)  CRITICAL TECHNOLOGIES  (Work unit title)
--  11A - TITLE SECURITY: U
--   12 - S + T AREAS:
--                    000400 ADMINISTRATION AND MANAGEMENT
--   13 - WORK UNIT START DATE:  OCT 79

--   14 - ESTIMATED COMPLETION DATE:    SEP 82
-- 15A - PRIMARY FUNDING AGENCY:  NAVY
--   16 - PERFORMANCE METHOD:    CONTRACT
--17A1 - CONTRACT/GRANT EFFECTIVE DATE:     NOV 81
--17A2 - CONTRACT/GRANT EXPIRATION DATE:    NOV 82
--  17B - CONTRACT/GRANT NUMBER: N00173-80-C-0014
--  17C - CONTRACT TYPE:   COST-PLUS-FIXED-FEE
--  17E - KIND OF AWARD:   CON
--  17F - CONTRACT/GRANT CUMULATIVE DOLLAR TOTAL:    $ 97,000
-- 19A - DOD ORGANIZATION:       NAVAL RESEARCH LABORATORY MANAGEMENT
--        INFORMATION DIV
-- 19B - DOD ORG. ADDRESS:       CODE 1404 WASHINGTON, DC 20375
-- 19C - RESPONSIBLE INDIVIDUAL:      WINSLOW, L M
-- 19D - RESPONSIBLE INDIVIDUAL PHONE: 202-767-2887
-- 19U - DOD ORGANIZATION LOCATION CODE:  1100
-- 19S - DOD ORGANIZATION SORT CODE:  33632
-- 19T - DOD ORGANIZATION CODE: 251950
-- 20A - PERFORMING ORGANIZATION:     DATA SOLUTIONS CORPORATION
-- 20B - PERFORMING ORG. ADDRESS:     2095 CHAIN BRIDGE ROAD VIENNA, VA 22180
-- 20C - PRINCIPAL INVESTIGATOR:      PROCTOR, J DR
-- 20D - PRINCIPAL INVESTIGATOR PHONE: 703-893-1360
-- 20F - ASSOCIATE INVESTIGATOR (1ST): GOULD, R DR
-- 20U - PERFORMING ORGANIZATION LOCATION CODE: 5110
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-- 20N - PERF. ORGANIZATION TYPE CODE:  4
-- 20S - PERFORMING ORG. SORT CODE:    13748
-- 20T - PERFORMING ORGANIZATION CODE:      390728
-- 21E - MILITARY/CIVILIAN APPLICATIONS:     MILITARY
-- 22 - KEYWORDS:  (U)  TECHNOLOGY TRANSFER        ,
-- 23 - TECHNICAL OBJECTIVE:   (U)  TO PROVIDE TECHNICAL ASSISTANCE TO NRL
--      CODE 1404 IN ESTABLISHING A DATA BASE ON CRITICAL TECHNOLOGIES. DATA
--      SOLUTIONS CORP. (DSC) WILL CONCENTRATE ON METHODS TO IMPROVE THE
--      CREDIBILITY OF THE DATA AND INDENTITY QUESTIONNAIR PREVIOUSLY DEVELOPED
--      AT NAVMAT BY LES WINSLOW. DSC WILL AID IN THE ADMINISTRATION OF THE
--      QUESTIONNAIRE.
-- 24 - APPROACH:  (U)  THE SUBJECT QUESTIONNAIRE WILL BE EVALUATED FOR
--      RELIABILITY OF RESPONSE AND CREDIBILITY OF RESULTS SINCE DSC IS AN
--      INDUSTRIAL PSYCHOLOGY ORIENTED FIRM. DSC WILL ALSO CORRELATE THE
--      QUESTIONNAIRE RESPONSES TO THE NRL CRITICAL TECHNOLOGY COMMITTEE.
-- 25 - PROGRESS:  (U)  THE QUESTIONNAIRE HAS BEEN DISTRIBUTED. THE RESPONSE
--      RATES OF MORE THAN 75% HAVE BEEN ATTAINED AT NAVELEX AND NAVSEA. THE
--      INITAL DATA ANALYSIS OF THE QUESTIONNAIRE RESPONSES INDICATE THE PROCESS
--      WORKS. FURTHER WORK ON ANOMALOUS RESPONSES IS IN PROGRESS. THE
--      QUESTIONAIRE HAS BEEN ADMINISTERED TO NAVAIR, ONR NAMVAT AND THE NRL
--      CRITICAL TECHNOLOGY COMMITTEES. THE INITIAL VALIDATION STUDIES HAVE BEEN
--      COMPLETED AND INDICATE THE DATA BASE HAS A HIGH DEGREE OF VALIDITY. A
--      NEW CONTRACT WITH MAXIMUS, INC WILL CONTINUE FOR VALIDATION OF PRIOR

--
--      DATA ENTRIES UNDER THE DIRECTION OF DR. PROCTOR.
-- 31 - RESP. ORG. INSTALLATION DIGRAPHS:  1404
-- 32A - RESP. INDIVIDUAL ORGANIZATION SYMBOL:    1404
-- 31A - RESP. ORG. INSTALLATION 1ST DIGRAPH:   14
-- 31B - RESP. ORG. INSTALLATION 2ND DIGRAPH:   04
-- 37 - DESCRIPTORS:       (U)  TECHNOLOGY TRANSFER      ,(U)  RELIABILITY ,(U)
--      INDUSTRIAL PSYCHOLOGY     ,(U)  DATA BASES  ,
-- 39 - PROCESSING DATE (RANGE):       25 AUG 82
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TABLE OF CONTENTS

EXHIBITS

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I. GENERAL

As detailed in the report which follows, Task 1 and 2 of Contract #N00173-80-C-0014 have been completed. In addition, the appropriate activities and reports pursuant to Task 3 and 4 have been accomplished.

II. TASK ACCOMPLISHMENTS

A. Background

The Critical Technology questionnaires were originally designed by NAVMAT with the intention of distribution and completion by the System Commands in the Navy for the examination and identification of critical and possibly critical technologies. The questionnaires were distributed by NAVMAT in July and August of 1979 among thirty pilot test participants from NAVELEX. Great effort was entailed in order to obtain a 100% response rate. This was eventually achieved and the questionnaire data was machine processed by NARDAC and a computer base was established. The pilot data was computer analyzed by the use of a model developed by Mr. Les Winslow, Critical Technology Assessment (CTA) Office, Naval Research Laboratory, as a means of establishing the "need", "can" and "how" to control assessments for critical technologies. Key output was, therefore, the assignment of a score for "need", "can" and "how" to control technical data, keystone equipment and end products according to responses on the pilot questionnaires. According to contractual requirements, essentially the same mode of analysis was to be implemented for the data resulting from the actual survey and, as such, the substance of the questions, and quantification of response categories were to remain essentially intact during questionnaire revision by Data Solutions.

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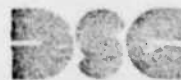
B. Critical Technology Questionnaires

Data Solutions was contracted to assess and increase the potential validity and reliability of the pilot test questionnaires (Exhibits A) and to incorporate other improvements in both the questionnaire and administration technique to increase the response rate and facilitate machine processing of questionnaire data.

1. Pilot Test

In order to assess the validity and reliability of the questionnaire data, it was essential to review the pilot test conducted by the CTA Office. Whereas the CTA Office took care to brief pilot respondents subsequent to administration, and solicit their feedback, systematically obtained information was lacking concerning respondents reactions/criticisms of the survey instruments (e.g., item utility, instruction clarity, ease of response time to complete, etc.) or the administration technique.

In mid-December, Data Solutions undertook the task of re-tracing the pilot test, its methodology, participants, and data processing. This involved visits and interviews with pilot test participants at NAVELEX. A meeting with Mr. Tony Slaga, Head, International Program Office, NAVELEX, (December 11, 1979) uncovered the following information about the pilot test administration at NAVELEX:

- The selection for participation in the pilot was based on criterion of knowledgeability.

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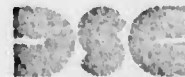
- An average of five people made recommenda-
  tions of people at the systems level of
  technology.

- Knowledgeability criterion led to the
  selection of <u>project engineers</u> with a
  <u>number of years of experience</u> which
  equipped individuals with knowledge of
  past and present policies in regard to a
  particular technology area.

- Mr. Slaga suggested that the individual
  responsible for farming out case-by-case
  inquiries (in the case of NAVELEX - Mrs.
  Haden) would be most able to identify such
  individuals.

Following the NAVELEX meeting, Data Solutions
consultants held meetings with four(4) pilot test participants.
In order to optimize feedback about the questionnaires, the
questionnaires were revised so that interviewees were asked
for reactions to both the original questionnaires and the
revised questionnaires. Furthermore, revised questionnaires
were distributed during a briefing of the Critical Technology
Assessment on January 4, 1980 including interested officials
from NAVMAT, NRL, and ONR.

Pilot test interviewees reported problems with
questionnaire terminology such as "critical technology" and
"subdivisions". In addition, interviewees reported that they
simply did not know for certain the answer to some questions

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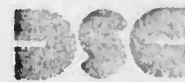
such as the extent of military lead of the U.S. over other
nations or visa versa in relation to their specific technology.
In these cases the participants often reported a "don't know"
response, or simply left the question blank. Other problems
were reported with instructions and background information.

A final, and crucial, aspect of pilot testing
concerned the validation of the mathematical model employed to
analyze the questionnaire data. The model, as presented in
"Computer Analysis for Interim Policy Formulation of Export
Control Policies", was designed by Mr. Les Winslow, the COTR.
It provides, in general, a hierarchical weighting formulation
which results in an assessment of the necessity, feasibility,
and method of export control for each Navy system, subsystem,
and device for which a data questionnaire is completed. After
the pilot test had been completed (N=30) at NAVELEX, the COTR
requested that three Navy technical experts with broad areas of
cognizance and unquestioned knowledgeability individually assess
the criticality of each Navy system included in the pilot test.
This provided Data Solutions consultants with an opportunity to
assess the convergent validity of the data analysis technique,
by computing the correlation of the experts responses with the
correspondent data analysis results. The mean correlation of
the three expert judges' independent assessment of technical
criticality with the assessment of the computer analysis was
$r_{xy}=.52$, which is a significant positive correlation at $p<.01$
level of confidence. In sum, these findings conveyed significant
support both to the validity of the mathematical model employed
in the data analysis and the adequacy of computer analysis by
which it was implemented.

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2. Major Questionnaire Revisions

The following modifications were made to reduce ambiguity and thereby to encourage completion and increase the reliability and validity of responses:

- question and response category wordings were clarified and made more direct.

- instructions were clarified and added where necessary.

- definitions were included for significant or ambiguous survey terminology.

Two revisions were made to prepare questionnaire data immediately for machine processing and thereby greatly reduce manual preparation:

- response codes were included on the questionnaire and respondents instructed to circle appropriate response codes to indicate their response per question.

- columns were included on the questionnaires by each question to indicate to keypunchers in which column to punch each response and the associated column number per response, thereby incorporating keypunch instructions directly on the questionnaire.

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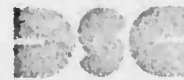
At the same time this reduces edit and keypunch error. However, questionnaires will still be checked to be certain that response codes, not the response, are circled before going to keypunching. This will reduce both effort and time expenditure.

For questions 11, 20, 22, and 26 on the pilot Data Questionnaire, the response scales were modified to render them more sensitive while maintaining the integrity of the computer analysis. Specifically, a number of questions requiring highly subjective judgments had three point response scales: "yes", "no", and "don't know". Such a scale has low sensitivity because, short of being absolutely certain, the respondent will be inclined to respond "don't know". Thus, for four (4) questions in this category, response scales were modified such that respondents are asked <u>to indicate their level of certainty</u> concerning the item stem on a five point scale. For example, instead of "yes", "no", or "don't know" response to a question whose stem requires a judgment of U.S. technological superiority, the following response scale was substituted:

confident U.S.   confident U.S.
  <u>does</u> <u>not</u>   <u>does</u>
    1 . . . . . 2 . . . . . 3 . . . . . 4 5

In sum, by requiring a judgment of confidence, responses at the 2 or 4 level provide for the equivalent of a "probably no" and "probably yes" response, respectively.

To clarify the questionnaire instruction, the following revisions were made:

- 6 -   DATA SOLUTIONS CORPORATION
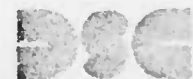
- Instructions for specific or following specific questions or, following a part of the questionnaire, were included where they occurred rather than on the front page as originally designed.

- Instructions were outlined in blocks so as to stand out from the rest of the questionnaire and make it less likely for respondents to skip instructions.

- Formating: the questionnaires were color coded and instructions referred to colors facilitate instructions and ease of response. The System Identity Questionnaire, Part I was printed in yellow, the System Identity Questionnaire, Part II was printed in green, and the Data Questionnaire was printed in blue.

3.   Additional Revisions

    a.   Systems Identity Questionnaire, Part I

- We made an addition to Q1 for respondents to indicate which level they are responding. This will facilitate data processing and keep clear the level of the response both to individuals completing the questionnaires and those involved in processing questionnaire data.

    b.   Data Questionnaire

- Question 1: "Does this technology make a

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significant contribution to the performance
of a Navy system, its subsystem or devices?"
This question was omitted from the revised
questionnaire because all but one of the
pilot respondents responded "yes" to this
question. Since it carried very little
variability, it has low utility.

● Column widths for Q14 and Q15* were origin-
ally two each. We changed the column widths
for both questions to one, thereby eliminating
the necessity of punching "Y" for one category
and "N" for the other for both questions.
Instead the responses will be keypunched either
as a "A" or a "B" per question with the consider-
ation of a "C" category, which would represent:
"equally military...and commercial...", if this
is possible.

The intention here is to encourage the respon-
dent to select "A" or "B" as a single response.
Originally the design of response category was
more conducive to a multiple response.

● Q19 and Q20** will be used as logic checks to
indicate whether questionnaires should have
been completed at the subsystem and/or device
level of a given system.

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*   Questions 15 and 16, respectively, on the pilot questionnaire.
** Questions 20 and 21, respectively, on the pilot questionnaire.

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- Clarified instructions for Q22 and Q23*
  where respondents are asked to rate 5 items
  with the sum = 10, to ensure consistency
  of response.

- A "yes" response for both Q19 and Q20**
  would indicate that there are embedded tech-
  nologies for which questionnaires should be
  completed.

4.   Questionnaire Printing

Questionnaires were finalized and ready for type setting
by the first of January, 1980. On January 2, the final revision
of the questionnaires was sent to Gumpert Printing for type set-
ting. The questionnaires went back and forth a few times between
Data Solutions and Gumpert before Data Solutions was satisfied.

Questionnaires were to be printed from the blue lines at
the Navy, developed by Gumpert Printing. On January 11, ques-
tionnaire blue lines were presented to the Navy for copying. The
Navy Research Lab could not handle the request for 5,000 copies,
so a contractor at the Navy Yard was enlisted to do the copying.
The questionnaires were copied onto 8½ by 11, on front and back
sides of the paper, and stapled 3 times on the side, as follows:

    white paper - for front page of questionnaire,
                   instructions and the last page.
    yellow paper - for Systems Identity Questionnaire,
                   Part I.

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* Questions 23 and 24, respectively, on pilot questionnaire.
** Questions 20 and 21, respectively, on pilot questionnaire.

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green paper - for Systems Identity Questionnaire,
Part II.

blue paper - for Data Questionnaire.

By January 18, all 5,000 copies of survey booklet had been produced. The questionnaires were delivered to the CTA Office, Naval REsearch Laboratory.

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III. SURVEY ADMINISTRATION

A. Overview

The Critical Technology Transfer Assessment Survey has
been designed to collect information about the criticality of
technology or hardware for three levels of detail for any given
system: the system level, the subsystem level and the device
level. However, it is entirely possible that some respondents
at the system level will not feel that there are subsystems
within their system which should be examined for export control
and the same for the subsystem respondents in regard to the
device level.

The respondent at each level will identify the subdivisions
for his equipment and the associated individuals to respond to
the same questionnaire at the next lower level, etc. This means
that the survey is essentially a three cycle survey. (See
Figure 1 for flow chart of survey administration). This cycle
will take place at each system command: NAVSEA, NAVELEX, NAVAIR,
and NAVMAT with each cycle beginning with the system level and
ending at the device level.

B. Identification of Survey Population

The systems level population will be identified from a list
of systems developed by NAVMAT (Exhibit C) in addition to those
identified by the point of contact for each command. In most
cases the questionnaires will be routed to the head office for
each system, at which point the most knowledgeable person for
each system will be designated to complete a survey booklet.
Originally, Data Solutions intention was to identify an indi-
vidual associated with each system so that tight control of

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CRITICAL TECHNOLOGY SURVEY ADMINISTRATION*
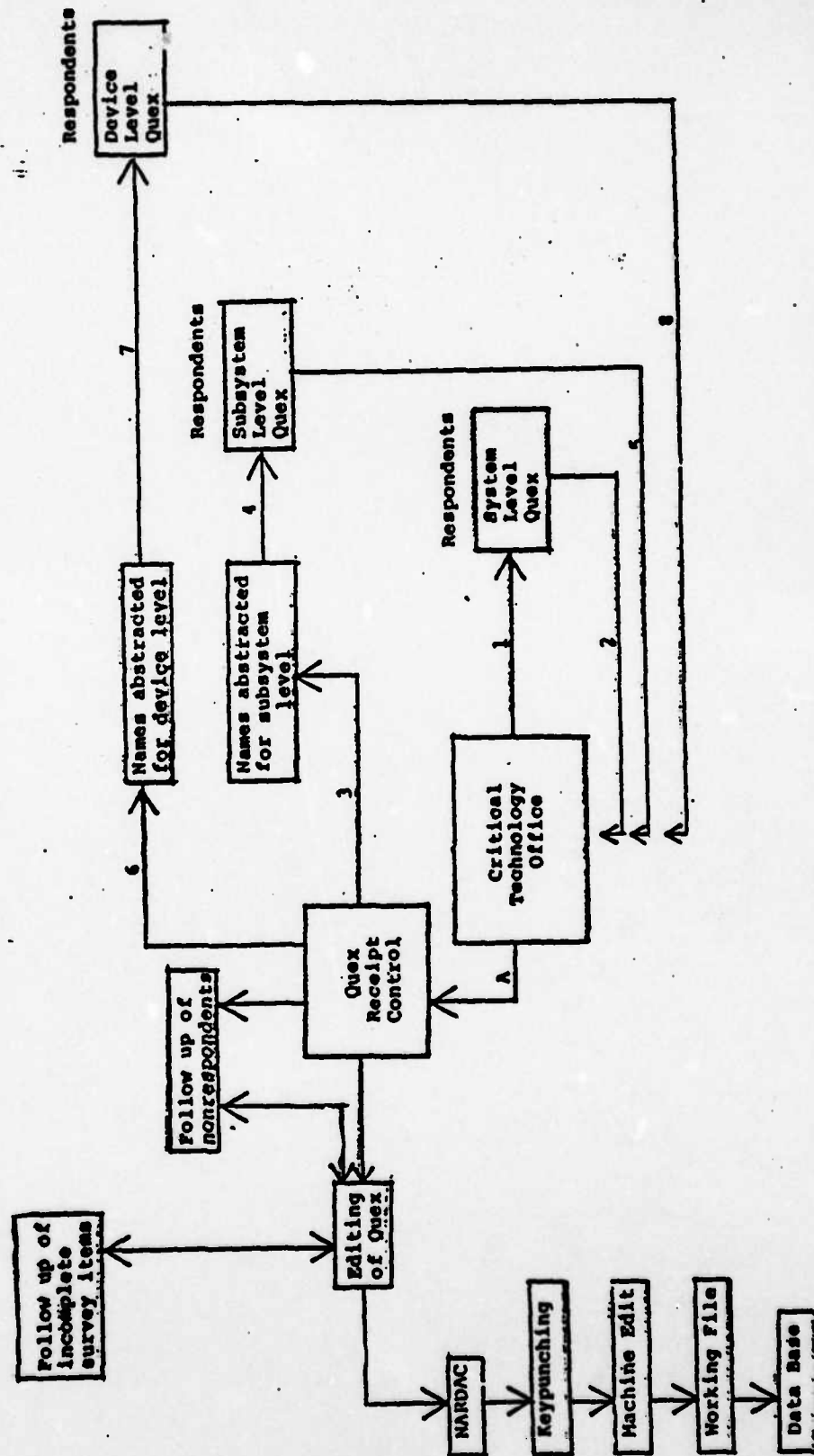
*Where: 1 through 8 shows sequence of SURVEY MAILOUT, "A" follows preceding
for all questionnaires so that "A" follows preceding and
"A" follows "8".

Figure 1: Flow Chart of Administration

field operations could be maintained. However, Mrs. Katherine Weick at NAVSEA strongly suggested that routing to head offices for each system is the most appropriate and expedient procedure to follow, since the individual completing a survey booklet will be designated directly by a closely associated superior.

C.   Survey Packets

Each survey packet will be compiled as follows:

1. one route sheet completed and addressed (Exhibit D).
2. route sheet stapled to an envelope.
3. inside the envelope - one letter (see below) from the systems commander, and one questionnaire.

The original intention was that a survey letter from Admiral Whittle would accompany the questionnaires so as to greatly facilitate response. This did not take place. Instead, a letter (Exhibit E) was created and signed by Edward J. Otth, Chief Deputy Navy Material (Acquisition). This letter was sent on February 1, to the commander of each system command. The commander at each system command would then designate appropriate individuals within their command to be the point of contact for the survey administration at their command. Each point of contact will decide whether they will refer to the Otth letter on the route sheets, or send a letter from their own office. NAVSEA chose to include the Otth letter, whereas NAVELEX included a letter from their office (Exhibit F), drafted by Data Solutions.

In order to handle the field operations in Crystal City, Data Solutions hired a part-time employee to administer survey

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procedures. The Data Solutions Field Operator went to NAVSEA
following the initial meeting and completed our list of systems
level respondents by consulting with Mrs. Weick to ensure that
proper organization codes were associated with the systems on
our list, and to resolve ambiguities about cognizance. Our
final list included 365 systems at NAVSEA.

In addition to completing a route sheet for each system,
the phone number for respondent questions was written inside
each questionnaire. The telephone number is included on each
questionnaire to handle respondent questions promptly, and to
create uniform interpretation of questions.

The telephone numbers were not printed on the questionnaires,
since it had not been determined at printing time who the points
of contact would be. A record of respondent problems and
questions will be maintained by each point of contact on a
telephone record sheet (Exhibit G). This will ensure uniformity
of resolutions and decisions, and also provide valuable informa-
tion about any problems with the survey.

In addition, questionnaire ID numbers were written on
each questionnaire. Questionnaire ID numbers were developed by
sequencial numbering of the systems list. This same number was
transcribed on to the corresponding route sheet, and the receipt
log (Exhibit H).

D.   Survey Cycle One: Status

The questionnaires for NAVSEA will be sent via the inter-
Navy mail system from the point of contact's (POC's) Office.   A

route sheet (Exhibit D) will be completed for each system with the appropriate organization code. The questionnaires will arrive at the top level for each such organization code and at such office, the questionnaires will be routed to the most appropriate individual to respond for each particular system.

Originally the POC for NAVSEA was Mrs. Katherine Weik, Foreign Liaison Program Head. By decision of NAVMAT, the POC was changed to be Mr. Stanley Marcus, Director, Office of Research and Technology[1]. Actual administration of systems level questionnaires began the week of February 25th.

At NAVELEX, Mr. Tony Slaga, Head, International Programs Office is to be the point of contact, and George Driscoll will be the name included on questionnaires and route sheets for respondent questions. Mr. Slaga did not develop the systems list for NAVELEX from the original list developed by NAVMAT. Instead, he created his own list and gave the list to Data Solutions. However, only five of the systems on that list were included on our original list, and visa versa. Mr. Slaga checked over the original list and identified 30 additional

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[1] Whereas the contractual requirements for Task 2 were completed on schedule in the sense that an effective survey administration was devised and logistical support for implementation was provided, the actual administration at two of four Systems Commands was delayed due to Navy difficulties in assigning a point of contact at NAVSEA and NAVAIR, and in providing a cover letter to accompany the questionnaire from an appropriate officer in NAVMAT. Details of the chronology of events that precipitated the delay are on record and will be made available upon request.

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systems for cognizance at NAVELEX. This results in a total of 80 systems at NAVELEX. Actual administration of systems level questionnaire began the week of February 18th.

The point of contact at NAVAIR will be Mr. William Norris[2]. There has been considerable difficulty in devising a list of NAVAIR systems. At a meeting attended by Mr. Norris, Mr. E.M. Tupman, Director, Security Division, Mr. Winslow, Mr. Donleavy, Dr. Gould (DSC) and Ms. Losonczy (DSC) on March 5, 1980, it was agreed that NAVAIR would be provided with an operational defini-tion of systems and that a memo would be sent out to appropriate offices in NAVAIR which would include this definition and request a list of NAVAIR systems under Office cognizance be returned. An operational definition was supplied the same day, and further progress towards actual implementation of the administration pro-cedure awaits the compilation of this list in Mr. Norris' office.

Finally, in consultation with the COTR, it was decided that cognizant technical experts at NAVMAT could also make a substan-tial contribution to the data collection process. A briefing was, therefore, held on February 26, 1980, attended by Mr. Winslow, Mr. Dunleavy, three targeted experts at NAVMAT (G. Schubert, J. Crane, and R. Young) and R. Gould and K. Losonczy, represent-ing DSC. By agreement at this briefing, a DSC representative delivered questionnaires to G. Schubert and R. Young on February 28, 1980, and our further aid in the administration logistics at NAVMAT will be given upon their request.

2/ See Footnote 1, on preceding page.

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E.   Survey Cycle Two

    After questionnaires from the systems level respondents
are completed and returned to the points of contact, Mrs. Gwen
Morsch of Data Solutions will abstract the name of persons and
subsystems identified by the systems level respondents on their
questionnaires. This will involve three consistency checks:

        1.   the response to question 8, Systems Identity
            questionnaire, Part I should be "yes".

        2.   for subsystems listed in the Systems Identity
            Questionnaire, Part II, a corresponding "yes"
            should be indicated for export control examin-
            ation on question 1.

        3.   question 2, Systems Identity Questionnaire,
            Part II, should list those subsystems identified
            in question where "yes" is indicated for examin-
            ation of export control.

    In cases where there is an inconsistency in the above
response pattern, the respondent will be contact to clear up
the ambiguity.

    Individuals' names abstracted as described above, will
receive survey packets identical to those sent to the systems
level respondents. Subsystem level questionnaires will go
through the same receipt control and editing procedures as
followed for the system level questionnaire, cycle one.

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F.   Survey Cycle Three

After questionnaires are received from the subsystem
respondents, device level respondents will be identified in
the same way as were the subsystem respondents, but from the
subsystem respondents. A receipt log will be created, etc.,
as for cycle one and cycle two.

G.   Receipt Control and Editing

As the questionnaires from the systems level respondents
are received at the points of contact, they will be logged in
by Mrs. Morsch, Field· Operations, and checked for completeness
and consistency of response. If there are any questions with
a questionnaire, the respondent will be contact for clarifica-
tion. Non-respondents will be followed up and encouraged to
complete and return their responses.

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IV. DATA ANALYSIS

Data Solutions was also tasked "to evaluate input data quality and validation procedures to assure that the mathematical model and computational procedures are appropriate to the problem being addressed". Whereas steps taken to validate the mathematical model for data analysis and to insure the quality of input data upon receipt have been detailed, Data Solutions has also proposed additional computational procedures to facilitate the correlation of the questionnaire findings with the deliberations of the Critical Technology Assessment Committees of the Naval Research Laboratory. Specifically, at a meeting held on January 28, 1980, attended by DSC representatives, the COTR, and representatives of NARDAC, DSC consultants proposed computational procedures to be employed to establish criticality criteria for the categorization of questionnaire measures. The following points were made:

- Selection of criteria for criticality measures from the DQ must be made by examining the variability of scores for any particular measure <u>across</u> systems, subsystems, and devices assessed. It is only by <u>comparison</u> with other scores that any particular rating can be meaningful.

- Measures of interest should be converted to standardized scores (z scores) by use of the following formula:

$$z = \frac{x - M}{s}$$

x = "normalized" score

M = mean "normalized" score across level (system, subsystem, device)

$$S = \text{variance} = \sqrt{\frac{\Sigma (x_i - M)^2}{N}}$$

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- 19 -
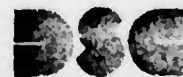
In this form, the mean (m) of the standarized scores
will always equal zero (o), and the standard devia-
tion will always equal one (1). Further, changing
the scores in any distribution to "z" scores does
not alter the shape (or mathematical form) for the
distribution. The frequency of any given "z" score
is exactly that of the "x" score corresponding to
it in the distribution.

● Our suggestion that each level of the DQ (system,
subsystem, device) be standardized independently
is based on the assumption that the form of these
distributions will vary, or that at least the latter
two will differ from the system level distribution.
This is due to the fact that at the subsystem and
device levels, equipment has a priori been identified
as potentially containing critical technology.

To check this assumption, we would suggest that
the distribution of "normalized" scores also be
plotted for each level, and the hypothesis that
the mean subsystem and device score will be higher
than the mean system score be checked. (An analysis
of variance for unequal Ns as given in Winer, 1971
may be used to check for statistical significance
if this is desired).

● The final step, selecting criterion values of criti-
cality for each measure of interest, may then be
based on the standard deviation, and the criticality
category may be assigned as appropriate to the level
of the questionnaire. For example, the system level
distribution of standardized scores for the measure
"Need to Control-Technical Data" may be depicted as
follows:

- 20 -   DATA SOLUTIONS CORPORATION
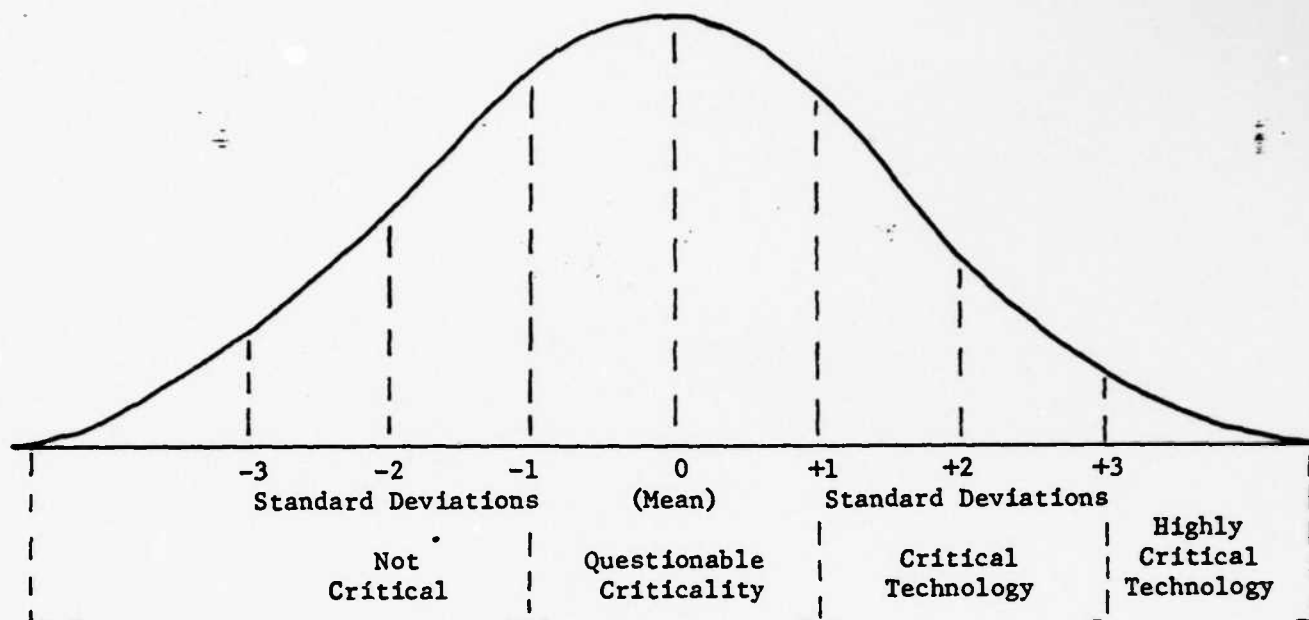
At the subsystem or device level, the categories may be altered; e.g.:
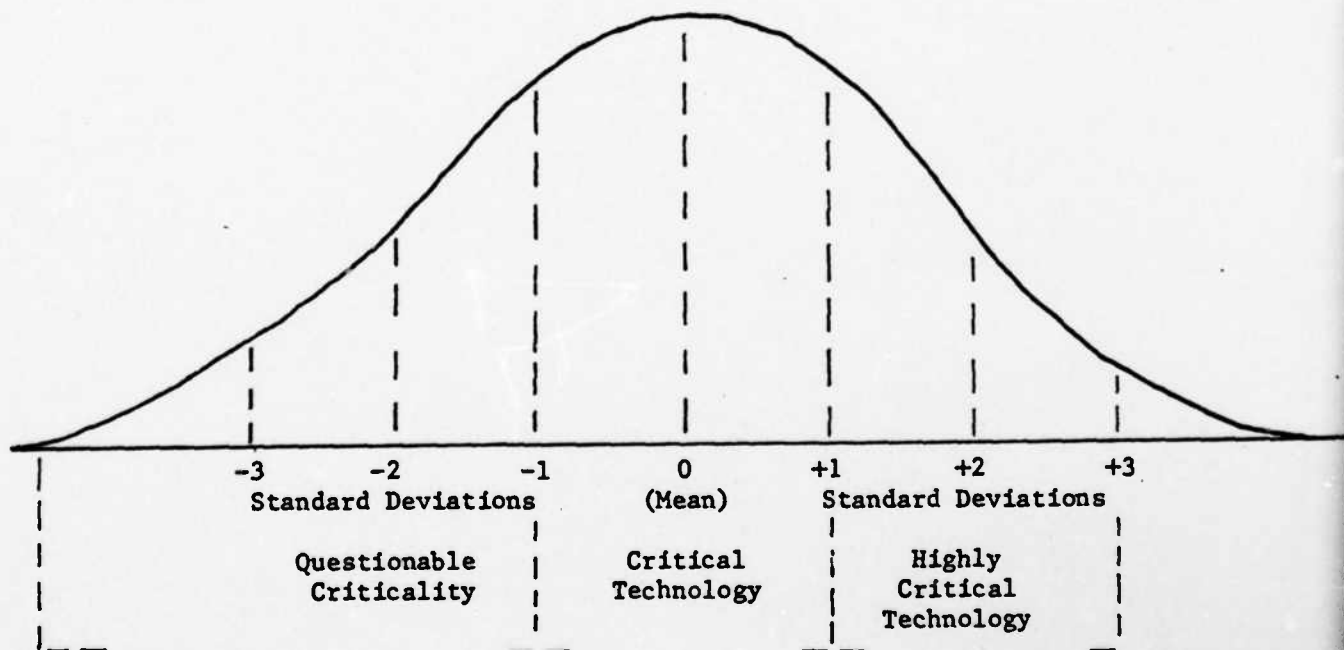
In addition, in conjunction with the COTR, DSC presented NARDAC representatives with the following priority list for analysis:

1. Need (T.D.) x Need (E.P.) x Need (K.E.)
2. (Need+Can+How) x (Need+Can+How) x (Need+Can+How)
         T.D.   E.P.   K.E.
3. Can (T.D.) x Can (E.P.) x Can (K.E.)
4. How (T.D.) x How (E.P.) x How (K.E.)
5. Need (T.D.)
6. Need (E.P.)
7. Need (K.E.)
8. Can (T.D)
9. Can (E.P.)
10. Can (K.E.)
11. How (T.D.)
12. How (E.P.)
13. How (K.E.)

        T.D. = Technical Data
        E.P. = End Product
        K.E. = Keystone Equipment

V. METHODS OF CRITICAL TECHNOLOGY ASSESSMENT
COMMITTEES OF THE NAVAL RESEARCH LABORATORY

On January 21, 1980, an orientation meeting was held at the MIC Building at NRL for key individuals involved in the Critical Technology Assessment process for the Navy. Data Solutions was represented by John Proctor, Robert Gould, and Kathy Losonczy. Key personnel from the Navy included Captain Fred Hueber and Jack Dunleavy (NAVMAT), Captian Richard Coe (OP-62), Les Winslow (NRL), Carla Askins (NARDAC), and approximately thirty (30) individuals selected to participate in the Critical Technology Assessment Committees. At this meeting Captain Hueber, the keynote speaker, summarized the chronology of events that have led to the Navy approach to systematically respond to the Export Administration Act (1979) mandate to provide a list of critical technologies and critical technology experts to be listed in the Federal Register by January 10, 1980, and outlined the method by which the contribution of the Navy to the technology Working Groups of the Institute of Defens Analysis. Mr. Winslow presented a detailed briefing concerning the formation, breakdown, coordination, scheduling, and outputs of the committees. He then introduced DSC consultants and described our dual role in relation to questionnaire data collection and transmission to committees, and the provision of guidelines for committee operating methods. Dr. Proctor then commented and elaborated on Data Solutions role in facilitating the committees' efforts.

Through the efforts of Mr. Winslow, in consultation with DSC, a series of three meetings were planned for the Chairs of the Critical Technology Assessment Committees (CTAC). The pur-

- 23 -
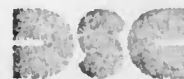
detailed information concerning the goals, available data
resources, desired products, and schedules of committee inter-
action, and to solicit input from Chairs concerning the methods
and guidelines by which committee operations would be per-
formed. In addition to Drs. Gould and Proctor, these meetings
were attended by a Data Solutions specialist in organizational
behavior, Dr. Harry Ammerman. These meetings were held on
February 10, 1980 and February 11, 1980. On February 14, 1980
Data Solutions submitted a draft version of Guidelines for
Critical Technology Assessment Committees to Mr. Winslow. A
slightly revised version of these Guidelines (Exhibit I) is
now being prepared for dissemination to all Committee Chairs.

DATA SOLUTIONS CORPORATION

EXHIBIT A

Instructions to Technology Identification Questionnaire

1. Program Designation is for identification purposes. Example: NAVSEA 652 - Surveillance System.

2. System Designation and Manufacture is for specification of the equipment being described on the questionnaire.

3. Level, indicates which level of the subdivision of the system is described in the questionnaire.

4. Sublevel Designation and manufacturer; specify the specific subdivision of the equipment by name and manufacturer. Example: Amplitron, QKS-8129 Raytheon.

5. Subdivision of (3). Specify the name of the subsystem, device or component and its function. Indicate the technology which best describes the important aspects of the specific subdivision being discussed. The technology may be design or fabrication; it may be a solid state device, a component or material. Does the system contain a technoloy or end product which provides a unique capability which the Navy should protect (answer yes or no). If the answer is affirmative, designate someone in the Navy to answer the Data Questionnaires, and this Technology Identification Questionnaire. Forward blank copies of the instructions and the questionnaires to that Designated Individual. (If desired two or three levels of the questionnaire can be completed by the same individual if the individual has the required knowledge).

6. Return completed copies to the person who completed the system level TIQ, for forwarding to NAVMAT 08D2.

EXHIBIT A: Pilot Questionnaire

Technology Identification Questionaire

code & phone no. _____

1. Program Designation _____
2. System Designation _____
3. Level: System, Subsystem, Device, Component, Material   Mr. _____ (circle one)
4. Sublevel Designation _____   Mr. _____
5. Subdivision of level (3). _____

Name of Subdivision	Function	Candidate	Name of technology (used in this level)
A)			
B)			
C)			
D)			
E)			
F)			

6. Please provide a brief description of the capabilities of this level (not subdivision) and the technologies which provide the capability.

_____
_____
_____

Candidate Technologies are those in which this subdivision, or a subsequent subdivision, has a technology or end product you believe should be protected from enemy acquisition. Answer yes or no.

_____ Designated Personnel for Candidate Tec___

Instructions to Data Questionaire

1. The questions in this questionaire are selected to allow the categorization of technologies which may require added protection from enemy acquisition. The questions are related to military capabilities, security classifications, manufacturing characteristics, funding, and new technologies. The answers will be subjective by necessity so don't mind putting a "don't know" if you don't have the answer. The questionaire should be completed in about ten (10) minutes.

2. This questionaire is complementary to the Technology Identification Questionaire (TIQ). One of these should be completed for each level and subdivision of that questionaire (TIQ). Blank copies of this Data Questionaire should be forwarded to the Designated Individual to be completed and returned to NAVMAT.

3. Return completed copies, along with the Technology Identification Question-aire to NAVMAT 08D2.

EXHIBIT A (cont'd)

ID # _____

Data Questionnaire
(Please answer questions in sequence)

PM _____
System _____
Level _____
Subject _____
Person _____

	Yes	No	Don't Know

1. Does this technology make a significant contribution to the performance of a Navy system, its subsystems, or devices? _____ _____ _____

2. Does the U.S. have a lead of 3 or more years in military capability over one or more members of the following group of nations?
   (a) NATO _____ _____ _____
   (b) WARSAW Pact _____ _____ _____
   (c) PRC _____ _____ _____
   (d) Third World _____ _____ _____

3. Do you believe the Warsaw Pact/PRC would replace their equipment or technology with ours if they had full data on how to make our equipment? _____ _____ _____

4. Does this technology support a revolutionary growth in military capability? _____ _____ _____

5. Would compromise of operational or performance information about this equipment seriously degrade its military utility? _____ _____ _____

(Note: Answer questions 6 & 7 only if specific equipments are involved.)

6. Is this equipment software classified?
   If yes, indicate security level _____

7. Is this equipment hardware classified?
   If yes, indicate security level _____

8. Which of the following relates to the most important aspect of the technology transfer at this level? (Check only one)
   (a) Data (operational or technical) _____
   (b) End product susceptible to reverse engineering _____
   (c) Processing equipment _____

	Yes	No	Don't Kn

9. (a) Is this technology most closely related to device or system integration? (Check one only)

or

   (b) Is the technology of this equipment based on a fabrication/manufacturing capability?

or

   (c) Is the essence of this technology/equipment principally the managerial skills and/or engineering that allow for successful design, engineering, and fabrication?

10. Is unique keystone equipment (equipment that is absolutely essential for economcally viable production) essential for manufacture of this equipment?

11. Do you believe it would take more than 3 years for the following nations to acquire the manufacturing capability of this technology upon acquisition of a unit of this equipment?
   (a) NATO
   (b) WARSAW Pact
   (c) PRC
   (d) Third World

12. Is this technology at this level based on highly trained personnel for
   (a) Design of production equipment
   (b) Operation of production/processing equipment
   (c) Operation of testing/calibration equipment

13. Does the design of the system depend greatly on the fabrication of the
   (a) Subsystems
   (b) Devices
   (c) Components
   (d) Materials

14. How would you classify the technology category of this level of this equipment? (Check one only)
   (a) Older technology, equivalent substitute available _____
   (b) Older technology, no substitute, little growth forecast _____
   (c) Older technology, substantial growth forecast _____

	Yes	No	Don't Kno

15. Is the technology base primarily driven by commercial R&D or military R&D funding? Commercial _____ Military _____

16. Is the technology base primarily driven by commercial sales or military sales? Commercial _____ Military _____

17. Is there a useful distinction between the technology exploited by the military versus the civil sector? _____ _____ _____

18. Is there a lag in military application of this technology behind civilian application of this technology? _____ _____ _____

19. Are the manufacturing sources for commercial products different than the manufacturing sources for military products? _____ _____ _____

20. Are there key components or subassemblies found within this equipment that may merit export control due to their military utility upon removal? _____ _____ _____

21. Are there extractable technologies contained within key components or subassemblies of this equipment that may merit export control? _____ _____ _____

22. Is there a manufacturing methods program directly applicable to this technology? _____ _____ _____

23. Rate the relative importance of the following technical processes of this technology. (Rate 1 to 10 where summation of ratings equals 10.)
    (a) Design _____
    (b) Fabrication _____
    (c) Processing _____
    (d) Materials _____
    (e) Testing _____

24. Rate the relative importance of this technology to the following levels. (Rate 1 to 10 where summation of ratings equals 10.)
    (a) Tactical _____
    (b) System _____
    (c) Subsystem _____

	Yes	No	Don't Kn

25. Does this equipment use technologies or components developed since 1960? ___ ___ ___

26. Are there new, emerging or competing mature technologies which may replace this technology level within 5 years? ___ ___ ___

27. Is there equipment now under manufacture or in advanced development that will replace the equipment being discussed in this questionnaire? ___ ___ ___

28. Is the equipment in the civilian sector more advanced or equivalent to this equipment? ___ ___ ___

29. Is the technology base primarily found (mark one)

    (a) in industry (with non-military funding) ___
    (b) in industry (with military funding) ___
    (c) in military or other government labs ___
    (d) in academic institutions ___

30. Is there a useful distinction between the equipment used in civilian applications versus military applications? ___ ___ ___

31. Is the equipment in the civilian sector more advanced or equivalent to that equipment that is the standard for the U.S. Navy? ___ ___ ___

32. Is the equipment in the civilian sector more advanced or equivalent to that equipment that has been most recently deployed by the U.S. Navy? ___ ___ ___

EXHIBIT A (cont'd)

EXHIBIT B

U.S. NAVY MATERIAL COMMAND
TECHNOLOGY TRANSFER ASSESSMENT SURVEY

BACKGROUND

The Export Administration Act - 1979 and OPNAVINST 5510.156 mandate that the control of design and manufacturing know-how, in addition to critical military end products of technology, is absolutely vital to the maintenance of U.S. technological superiority. In this regard, the Department of Defense has been urged to aid in maintaining the U.S. strategic technology lead by developing policy objectives and strategies for the export control of critical technologies.

In order to achieve this goal it is essential that specific critical technologies be systematically identified and assessed with regard to the necessity, feasibility, and method of export control to foreign countries. Toward this purpose the Critical Technology Assessment Office, under the auspices of the Navy Material Command, is conducting the TECHNOLOGY TRANSFER ASSESSMENT SURVEY.

Your contribution to this assessment is vital and will be greatly appreciated as your knowledge and judgment is the major source of data for this study. As a participant you are asked to respond to the enclosed SYSTEMS IDENTITY QUESTIONNAIRE and DATA QUESTIONNAIRE.

The data you supply will be computer analyzed by a pre-tested mathematical model, and the results will be integrated by panels of leading experts from government, industry, and academia. The final outcome of this process will be a computer supported data-base, amenable to updating, which lists specific critical technologies, assesses optimal methods for the control of their export, and provides a roster of cognizant technical experts.

SURVEY INSTRUMENTS

This survey booklet includes three parts: a SYSTEMS IDENTITY QUESTIONNAIRE, PART I (yellow pages), a SYSTEMS IDENTITY QUESTIONNAIRE, PART II (green pages) and a DATA QUESTIONNAIRE (blue pages). The questionnaires have been designed for ease of response; the majority of questions require a multiple choice answer.

The SYSTEMS IDENTITY QUESTIONNAIRE, PART I (yellow pages) asks you to identify the technology or hardware about which you are completing this survey booklet and, to ascertain whether sub-systems or devices exist which you feel should be evaluated for export control.

The SYSTEMS IDENTITY QUESTIONNAIRE, PART II (green pages) asks you to provide identifying information about subsystems or devices which you feel should be examined for export control and to name an appropriate individual to respond to a survey booklet for each such subsystem or device.

The DATA QUESTIONNAIRE (blue pages) asks questions about the characterisics of the technology/hardware that you identified in the SYSTEMS IDENTITY QUESTIONNAIRE, (yellow pages) so that necessity and feasibility of export control can be evaluated.

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* Additional background for the present study may be found in "An Analysis of Export Control of U.S. Technology — A DOD Perspective", ODDRE, 4 February 1976.

HEAO, CRITICAL TECHNOLOGY
ASSESSMENT OFFICE
NAVAL RESEARCH LABORATORY
WASHINGTON O C 20375
FORM #

SURVEY METHODOLOGY

The TECHNOLOGY TRANSFER ASSESSMENT SURVEY has been designed to collect data for a given technology or hardware system at the system level, subsystem level and device level as follows:

system level — one survey booklet should be completed for every technology/hardware system in the survey.

subsystem level — a survey booklet should be completed for every subsystem of a technology/hardware system which the respondent at the system level feels should be examined for export control.

device level — a survey booklet should be completed for every device of a subsystem which the respondent at the subsystem level feels should be examined for export control.

If you are knowledgeable about a given technology/hardware at more than one level then it is acceptable for you to complete a survey booklet for each su   bsystem or device.

> IF YOU HAVE ANY QUESTIONS THAT YOU NEED TO ASK IN REGARD TO THIS SURVEY, PLEASE
> CALL _____

DEFINITIONS

critical technology

This is the "know how" whose acquisition by another nation would significantly enhance the military operational capability of such nation, irrespective of whether such technology is acquired directly from the United States or indirectly through another recipient, or whether the declared end-use intentions by the recipient are for military or nonmilitary purposes.

keystone equipment

This is the manufacturing, inspection or automatic test equipment which can significantly contribute in and of themselves to the transfer of critical technology because they 1) embody extractable critical technology, or 2) are equipment which completes a process line and allows it to be fully utilized.

technical data

This means that information of any kind which can be used, or adapted for use, in the design, production, manufacture, utilization, testing, maintenance or reconstruction of articles or materials The data may take a specific form such as, a model, prototype, blueprint, or an operating manual, or flow in less tangible forms such as technical services or interactions.

technology

Technology is the "know how" used in the design, production, manufacture, testing, utilization or maintenance of materials.

export control

Export control refers to control of transfer of U.S. technology to foreign countries in order to protect critical technologies from enemy acquisition.

SYSTEMS IDENTITY QUESTIONNAIRE

PART I: Identification of the technology/hardware subject.

1. Name of person completing questionnaire:_____ (10-89)
   organization/code   _____ (20-49)
   area code and telephone number   _____ (50-61)

   level of your response: (CIRCLE EITHER 1, 2, or 3 to INDICATE LEVEL OF DETAIL AT WHICH YOU ARE
   RESPONDING)

                                                              system level 1
                                                              subsystem level . 2   (62)
                                                              device level 3

2. Identify the system in which the technology/hardware is embedded, which is the subject of this questionnaire,
   and give a brief description (10-15 words) of the function of that system. Include the subsystem name or de-
   vice name according to the level of your response:

   system name: _____ (83-92)
   system function: _____ (83-142)
                    _____
                    _____
                    _____
   subsystem name: _____ (143-172)
   device name: _____ (173-202)

   ┌───┐
   │ COMPLETE THE REMAINDER OF THIS QUESTIONNAIRE AND THE FOLLOWING DATA   │
   │ QUESTIONNAIRE (BLUE PAGES) FOR THE LEVEL YOU INDICATED IN QUESTION 1 ABOVE.│
   └───┘

3. Enter the name of the manufacturer of the technology/hardware at the level of your response:

   _____ (203-232)

4. Give a brief description (10-30 words) of the function of the technology/hardware described above. If you are
   responding at the system level, this will be the same as system function above, otherwise enter function for the
   appropriate level:

   _____ (233-432)
   _____
   _____
   _____

5. Indicate the technology areas which best represent the technology/hardware described in this questionnaire:
   (CIRCLE EITHER ONE OR UP TO FOUR CODES TO INDICATE YOUR RESPONSE)

computer network 01	microwave componentry 11	(433-434)
large computer system 02	military turbine engine 12	(435-436)
software technology 03	fiber and advanced optics 13	(437-438)
automated real-time control 04	sensor technology 14	(439-440)
materials, structure, fabrication 05	undersea system 15	
directed energy 06	nuclear 16	
LSI-VLSI design and manufacturing . . . 07	chemical 17	
military instrumentation 08	cryptography 18	
telecommunications 09	E.W./radar 19	
guidance and control 10		

6. Is this equipment, or a close derivative sold under Foreign Military Sales? (CIRCLE EITHER "Y" OR "N" TO
   INDICATE YOUR RESPONSE)

   yes . . . . Y   (441)
   no . . . . N

7. Are there different names of commercial derivatives of this equipment that are sold either commercially or
   under foreign military sales? (CIRCLE EITHER "Y" OR "N" TO INDICATE YOUR RESPONSE)

   yes . . . . Y   (442)
   no . . . . N

   name(s) of commercial derivatives if "yes" above:_____   (443-802)

**ANSWER QUESTION 8 IF YOU ARE RESPONDING AT THE SYSTEM OR SUBSYSTEM LEVEL. IF YOU ARE
RESPONDING AT THE DEVICE LEVEL GO TO DATA QUESTIONNAIRE (BLUE PAGES).**

---

8. Do you believe there are technologies embedded in the level described in this questionnaire that should be
   evaluated for export control? (CIRCLE EITHER "Y" OR "N" TO INDICATE YOUR RESPONSE)

   yes . . . . Y   (803)
   no . . . . N

**IF YOU ANSWERED "YES" FOR QUESTION 8 GO TO PART II OF SYSTEMS IDENTITY QUESTIONNAIRE
(GREEN PAGES) OTHERWISE IF YOU ANSWERED "NO" SKIP GREEN PAGES AND GO DIRECTLY TO
TO DATA QUESTIONNAIRE (BLUE PAGES).**

SYSTEMS IDENTITY QUESTIONNAIRE

PART II: Identification of subdivisions of the technology/hardware identified in PART I of this questionnaire.

1. Identify the subdivisions of the technology/hardware described at the lowest level of detail in PART I of this questionnaire. If you are responding at the system level; then subdivision refers to subsystem, or if you are responding at the subsystem level; subdivision refers to device. Indicate if each subdivision should be examined for export control. (CIRCLE EITHER "Y" OR "N" TO INDICATE YOUR RESPONSE)

	Name of subdivision		Examine for export control yes / no		
A.	_____	(804-833)	Y	N	(834)
B.	_____	(835-864)	Y	N	(865)
C.	_____	(866-895)	Y	N	(896)
D.	_____	(897-926)	Y	N	(927)
E.	_____	(928-957)	Y	N	(958)

> **IF YOU IDENTIFY MORE THAN FIVE SUBDIVISIONS THEN USE AN ADDITIONAL SHEET OF PAPER AND ATTACH. INCLUDE QUESTION 2 INFORMATION FOR EACH ADDITIONAL SUBDIVISION WHICH YOU BELIEVE SHOULD BE EXAMINED FOR EXPORT CONTROL.**

> **IF YOU INDICATED "YES" IN QUESTION 1 FOR EXPORT CONTROL OF ANY SUBDIVISION, COMPLETE QUESTION 2 FOR EACH SUCH CASE. OTHERWISE LEAVE QUESTION 2 BLANK AND GO TO DATA QUESTIONNAIRE (BLUE PAGES).**

2. Give information below for the subdivisions identified in QUESTION 1, PART II of this questionnaire which you believe should be examined for export control. "Name of contact" refers to the name of the individual who will complete a SYSTEMS IDENTITY QUESTIONNAIRE and a DATA QUESTIONNAIRE for that subdivision.

A. name of subdivision: _____ (659-688)
   function of technology/
   hardware of subdivision: _____ (689-738)
   name of contact: _____ (739-758)
   organization code of contact: _____ (759-778)
   telephone number and area code of contact: _____ (779-790)

B. name of subdivision: _____ (791-820)
   function of technology/
   hardware of subdivision: _____ (821-870)
   name of contact: _____ (871-890)
   organization code of contact: _____ (891-910)
   telephone number and area code of contact: _____ (911-922)

C. name of subdivision: _____ (823-852)
   function of technology/
   hardware of subdivision: _____ (853-1002)
   name of contact: _____ (1003-1022)
   organization code of contact: _____ (1023-1042)
   telephone number and area code of contact: _____ (1043-1054)

D. name of subdivision: _____ (1055-1084)
   function of technology/
   hardware of subdivision: _____ (1085-1134)
   name of contact: _____ (1135-1154)
   organization code of contact: _____ (1155-1174)
   telephone number and area code of contact: _____ (1175-1186)

E. name of subdivision: _____ (1187-1216)
   function of technology/
   hardware of subdivision: _____ (1217-1366)
   name of contact: _____ (1267-1286)
   organization code of contact: _____ (1287-1306)
   telephone number and area code of contact: _____ (1307-1318)

DATA QUESTIONNAIRE

The questions in this questionnaire were selected to allow for the categorization of technologies which require added protection from enemy acquisition. The questions are related to military capabilities, security classifications, manufacturing characteristics, funding, and new technologies.

1. Of the following group of nations indicate which ones the U.S. has a lead of three or more years in military capability in regard to this technology. (CIRCLE ONE NUMBER ON SCALE BELOW TO INDICATE YOUR RESPONSE FOR EACH GROUP)

	Confident that U.S. does not				Confident that U.S. does	
NATO......................	1	2	3	4	5	(1319)
WARSAW PACT...........	1	2	3	4	5	(1320)
PEOPLES REPUBLIC OF CHINA	1	2	3	4	5	(1321)
THIRD WORLD............	1	2	3	4	5	(1322)

2. Do you believe the WARSAW PACT/PEOPLES REPUBLIC OF CHINA would replace their equipment or technology with ours if they had full data on how to make our equipment? (CIRCLE ONE NUMBER ON SCALE BELOW TO INDICATE YOUR RESPONSE)

	Confident that they would not				Confident that they would	
	1	2	3	4	5	(1323)

3. Does this technology support a revolutionary growth in military capability? (CIRCLE ONE NUMBER ON SCALE BELOW TO INDICATE YOUR RESPONSE)

	Confident that it does not				Confident that it does	
	1	2	3	4	5	(1324)

4. Would compromise of operational or performance information about this equipment seriously degrade its military utility? (CIRCLE ONE NUMBER ON SCALE BELOW TO INDICATE YOUR RESPONSE)

	Confident that it would not				Confident that it would	
	1	2	3	4	5	(1325)

ANSWER QUESTION 5 and 6 ONLY IF SPECIFIC EQUIPMENTS ARE INVOLVED, AS OPPOSED TO
TECHNOLOGICAL KNOW-HOW, OTHERWISE GO TO QUESTION 7.

5. Is either of this equipment's software technical manuals or applications software classified? (CIRCLE
EITHER "Y" OR "N" TO INDICATE YOUR RESPONSE)

yes ....Y   (1326)
no ....N

If "yes" above indicate security level _____ (1327-1336)

6. Is this equipment's hardware classified? (CIRCLE EITHER "Y" OR "N" TO INDICATE YOUR RESPONSE)

yes ....Y   (1337)
no ....N

If "yes" above indicate security level _____ (1338-1347)

7. Which of the following relates to the most important aspect of the technology transfer at this level? (CIRCLE
ONE CODE TO INDICATE YOUR RESPONSE)

data (operational or technical) ....A   (1348)
end product susceptible to reverse engineering ....B
fabrication and/or material processing C

8. Indicate which of the following best describes this technology: (CIRCLE ONE CODE TO INDICATE YOUR
RESPONSE)

the technology is most closely related to device or system
  integration ....A   (1349)
the technology of this equipment is based on a fabrication/
  manufacturing capability...B
the essence of this technology is principally the managerial
  skills and/or engineering that allow for successful design
  engineering, and fabrication C

9. Is unique keystone equipment (equipment that is absolutely essential for economically viable production)
essential for manufacture of this equipment? (CIRCLE EITHER "Y" OR "N" TO INDICATE YOUR RESPONSE)

yes ....Y   (1350)
no ....N

10. Do you believe that it would take more than three years for the following nations to acquire the manufacturing
capability of this technology upon acquisition of a unit of this equipment? (CIRCLE NUMBER ON SCALE
BELOW TO INDICATE YOUR RESPONSE FOR EACH GROUP)

	Confident that it would not				Confident that it would	
NATO	1	2	3	4	5	(1351)
WARSAW PACT	1	2	3	4	5	(1352)
PEOPLES REPUBLIC OF CHINA	1	2	3	4	5	(1353)
THIRD WORLD	1	2	3	4	5	(1354)

11. For the technology at this level indicate whether it is based on highly trained personnel for each of the following: (CIRCLE EITHER "Y" OR "N" TO INDICATE YOUR RESPONSE)

	Yes	No	
design of production equipment	Y	N	(1355)
operation of production/processing equipment	Y	N	(1356)
operation of testing/calibration equipment	Y	N	(1357)

12. Does the design of the system depend greatly on the fabrication of each of the following? (CIRCLE EITHER "Y" OR "N" TO INDICATE YOUR RESPONSE)

	Yes	No	
subsystems	Y	N	(1358)
devices	Y	N	(1359)
components	Y	N	(1360)
materials	Y	N	(1361)

13. How would you classify the technology category of the level of this equipment? (CIRCLE ONE CODE TO INDICATE YOUR RESPONSE)

older technology, equivalent substitute available	A	(1362)
older technology, no substitute, little growth forecast	B
older technology, substantial growth forecast	C
long term emerging technology	D
near term emerging technology	E

14. Indicate whether the technology is primarily driven by commercial R&D or by military R&D funding: (CIRCLE ONE CODE TO INDICATE YOUR RESPONSE)

commercial R&D funding	A	(1363)
military R&D funding	B

15. Indicate whether the technology base is primarily driven by commercial sales or by military sales: (CIRCLE ONE CODE TO INDICATE YOUR RESPONSE)

commercial sales	A	(1364)
military sales	B

16. Is there a useful distinction between the type of technology exploited by the military versus that exploited by civil sector? (CIRCLE EITHER "Y" OR "N" TO INDICATE YOUR RESPONSE)

yes	Y	(1365)
no	N

17. Is there a lag in military application of this technology behind civilian application of this technology? (CIRCLE EITHER "Y" OR "N" TO INDICATE YOUR RESPONSE)

yes ....Y   (1386)
no ....N

18. Are the manufacturing sources for commercial products different than the manufacturing sources for military products? (CIRCLE EITHER "Y" OR "N" TO INDICATE YOUR RESPONSE)

yes ....Y   (1387)
no ....N

19. Are there key componenents or subassemblies found within this equipment that merit export control due to their military utility upon removal? (CIRCLE NUMBER ON SCALE BELOW TO INDICATE YOUR RESPONSE)

Confident   Confident
that there   that there
are not   are

1 ....2 ....3 ....4 5   (1388)

20. Are there extractable technologies contained within key components or subassemblies on this equipment that merit export control? (CIRCLE EITHER "Y" OR "N" TO INDICATE YOUR RESPONSE)

yes ....Y   (1389)
no ....N

21. Is there a manufacturing methods program directly applicable to this technology? (CIRCLE NUMBER ON SCALE BELOW TO INDICATE YOUR RESPONSE)

Confident   Confident
that there   that there
are not   are

1 ....2 ....3 ....4 5   (1370)

22. Rate the relative importance of the following technical processes of this technology: (RATE 1 to 10 WHERE SUMMATION OF RATINGS EQUALS 10)

design_____	(1371-1372)
fabrication _____	(1373-1374)
processing_____	(1375-1376)
materials_____	1377-1378
testing_____	(1379-1380)
sum = 10	

23. Rate the relative importance of this technology to the following levels: (RATE 1 to 10 WHERE SUM-
    MATION OF RATINGS EQUALS 10)

    tactical _____ (1301-1302)
    system _____ (1303-1304)
    subsystem _____ (1305-1306)
    device _____ (1307-1308)
    material _____ (1309-1300)
                    sum = 10

24. Does this equipment either use technologies or components developed since 1968? (CIRCLE EITHER
    "Y" OR "N" TO INDICATE YOUR RESPONSE)

    yes ....Y (1301)
    no ....N

25. Are there either new, emerging or competing mature technologies which may replace this technology level
    within five years? (CIRCLE NUMBER ON SCALE BELOW TO INDICATE YOUR RESPONSE)

    Confident   Confident
    that there   that there
    are not   are

    1 ....2 ....3 ....4 5   (1302)

26. Is there equipment now under manufacture or in advanced development that will replace the equipment being
    discussed in this questionnaire? (CIRCLE EITHER "Y" OR "N" TO INDICATE YOUR RESPONSE)

    yes ....Y (1303)
    no ....N

27. Is the equipment in the civilian sector either more advanced or equivalent to this equipment? (CIRCLE
    EITHER "Y" OR "N" TO INDICATE YOUR RESPONSE)

    yes ....Y (1304)
    no ....N

28. Within which of the following is the technology base primarily found? (CIRCLE ONE CODE TO INDICATE YOUR
    RESPONSE)

    industry (with non-military funding) .....A   (1305)
    industry (with military funding)..........B
    military or other government labs C
    academic institutions ....D

29. Is there a useful distinction between civilian applications of equipment versus military applications of equipment? (CIRCLE EITHER "Y" OR "N" TO INDICATE YOUR RESPONSE)

yes ....Y   (196)
no ....N

30. Is the equipment in the civilian sector either more advanced or equivalent to standard U.S. Navy equipment? (CIRCLE EITHER "Y" OR "N" TO INDICATE YOUR RESPONSE)

yes ....Y   (197)
no ....N

31. Is the equipment in the civilian sector either more advanced or equivalent to equipment which has been most recently deployed by the U.S. Navy? (CIRCLE EITHER "Y" OR "N" TO INDICATE YOUR RESPONSE)

yes ....Y   (198)
no ....N

THANK YOU FOR YOUR TIME AND PARTICIPATION. THE IMPORTANCE OF YOUR CONTRIBUTION CAN-NOT BE OVER-EMPHASIZED. PLEASE LOOK OVER YOUR RESPONSES AND PLACE THIS BOOKLET IN ENVELOPE PROVIDED, AND RETURN IT TO_____

EXHIBIT C

ORGINIAL SYSTEMS LIST

Active homing missiles
Condor
AGM 53A
Condor Dual Mode
Harpoon
AGM-84A

SHIP AND SUBMARINE SYSTEMS

Surveillance
SPS-29E   (62X)
SPS-32   (62X)
SPS-37A   (62X)
SPS-40B   (62X)
SPS-43A   (62X)
SPS-49   (62X)
SPS-58   (62X)
TAS Radar Auto (62Z5)

3D Air Search
SPS-30A   (62X)
SPS-33   "
SPS-39A   "
SPS-42
SPS-48A(V)   "
SPS-48(ATD)   "
SPS-52   "
SPS-52B   "
SPS-52C   "
SPY-1A   (62X)
    (AEGIS)

Surface Search
SPS-10F   (62X)
SPS-55   (62X)

Submarine Search
BPS-5A-C   (62X)
BPS-9A,C   "
BPS-12   "
BPS-13   "
BPS-14   "
BPS-15   (62X)

TV
VIMS   (6111)
BXQ-3/Type 15 (6111)
    Periscope (6111)
Type 18
    Periscope (6111)

EXHIBIT D: Original Systems List

FLIR

SIRIS

SIRED (Sub Infra Red Exploitation Device)

MK 68   62Y2

QRC FLIR

(AAS-28A Mod)

MK 68

Impr. EOSS

MK 86

Impr. EOSS - 62Y22

TARTAR - MK 74 Fire Control

SPG-51B
SPG-51C
SPG-51D   } 62Z21
MK 2 Mod 0 TV
MK 5 Mod 0 TV

TERRIER - MK 76 Fire Control

SPG-55A
SPG-55B   } 62Z21
SPG-55 "M" (Digital, CWAT, Track Mod.)

TALOS - MK 77 Fire Control

SPG-49A/B
SPW-2B   } 62Z21

BPDSMS Fire Control

MK 115   6224

NATO Sea Sparrow Fire Control

MK 91/0   62Z5

MK 91/1   62Z5 ~~x51305~~

Gun Fire Control

MK 13/0
MK 25/3
MK 25/5
MK 26/3.4
MK 35/2
SPG-24
SPG-50
SPG-52   62Y2
SPG-53
53A
53B, C, D, E   0—0
MK 68 EOSS
SPG-60
SPQ-9A

EXHIBIT D. (cont'd)

RF Detection Systems

WLR-1 *in fleet its 1965 - 30 counter house no*
WLR-1 DART
WLR-3 *obsolete*
WLR-6(V) 0444
* WLR-8(V)2 0445
* WLR-8(V)4 04756
WLR-11 (Mod. incl. WLR-1, SLR-12)
SLR-12
SLR-13
SLQ-21
BLA-4
WSQ-( )
BLR-12
BLR-13
BRD-7
IDPS (Interfer. DF Sys.)
APR-25 Mod *no*
Low-Cost EW Sys. (Design-to-Price) *same as AN/SLQ-32*
Starling
SSQ-72 (incl. Outboard)
Glassie Outrigger
TAC-105
WLR-14 *PME N7-1*

uavelex

EO Detection Systems

Fisheye
YANVIS
WLR-13 *PME 107-1*

Acoustic Systems

Hull Mounted

SQS-23/Steel Dome, TRAM, MIP — 63R
SQS-23/Steel Dome, TRAM, MIP, LORA — 63R
SQS-23/Steel Dome, TRAM, MIP, LORA, SST- 63R
SQQ-23/Rubber Dome (2 domes)- 63R
SQQ-23/Rubber Dome (2 domes), SST- 63R
SQS-26 CX/Rubber Dome + Prairie Masker- 63R
SQS-26 CX/Steel Dome - 63R
SQS-53/Rubber Dome + Prairie Masker- 63R
SQS-53/Steel Dome- 63R
SQS-56 - 63R

Variable Depth

SQS-35 - 63R

EXHIBIT C (cont'd)

Passive Towed Arrays

IETAS (Interim ETAS) — 63 R

ETAS (Escort Towed Array) — 63 R.

SUBMARINE

Search/Track

BQG-2B — 63 R.

BQR-7 — 63 R.

BQS-13 — 63 R

MPS Mod of BQS-13 (DIMUS) — 63 R

BQQ-5 (DIMUS) — 63 R

BQS-14 — 62 R

BQS-15 — 63 R

BQR-20/STASS — 63 R

BQH-5(V)/TUBA I — 63 R

TUBA I Upgrade — 63 R

BQH-4/TUBA II — 63 R

BSQ-3A Intrepid — 62 R

Classification

BQQ-3 — 63 R

Intercept

WLR-9A

WLR-12

BLR-14 (SAWS)

Command and Control Systems

Data Systems

NTDS Improved —612

Datacorts —612

DDG - TDS —612

Teletype Data Integrated Display (TIDY) - 612

Adv. Data Display group —612

Task Force Command Center —612

Escort Command and Control Center —612

Commanding Officers TDS (COTDS) - 612

SIAC - Phase I —612

SIAC - Phase II —612

SIAC - Phase III —612

Weapons Direction Systems   WDS

MK 2/1 (DE MK 8)

MK 4/0
4/1
4/2
4/4
4/5

MK 5/0
5/2

MK 6/0
6/1
6/2
6/3

MK 7/0
7/3

EXHIBIT D (cont'd)

WSC-2(V)2
Small Ship SHF
Submarine SHF
WSC-3

IPF
MK 12

Link Security

KG-40
KY-8
KY-28
NESTOR
PARK HILL
PLATO
VALLOR
Digit. Data

Navigation Systems

Gyrocompass

MK 19 Gyro — 6132
MK 23 Gyro — 6132
MK 27 Gyro — 6132
Adv. Stabilization Gyrocompass (ASG) — 6132
PL-41 Gyro — 6132

Inertial Navigation

SINS MK 2 — 6132
SINS MK 3/MSR — 6132
Dual Miniature Inertial Nav. Sys. (DMINS) 6132
Elec. Susp. Gyro Nav. (ESGN) — 6132

Velocity Measurement

EM Log — 6132

External Reference - Depth Measurement

UQN-1, 4 — 632
UQN-4A — 632
BQN-17 — 632

Absol. Position

LORAN C (SRN, BRN)

Omega (SRN-12, BRN-7)

Transit (SRN-9)

Stellar Nav.

NAVELEX

NAVSTAR Global Positioning System

<u>Relative Posit.</u>

TACAN - SRN-6
    - URN-20B

<u>RDF</u>

URD-4

<u>Carrier Landing Assist</u>

SPN-6 — 627
SPN-10, 42 L 2 x
SPN-12, 44 — 637
SPN-35, 35A — E47
SPN-41 — 628
SPN-43 — E64

Navelex

<u>Countermeasures</u>

<u>Signature Reduction</u>

Stack IR Shielding

Stonegate

<u>Deception</u>

ULQ-6A
ULQ-6B obsolete
ULQ-6C
ULQ-6/O-1331
SLQ-30 (ULQ-6 TRUMP)
SLQ-17
SLQ-19
SLQ-22
SLQ-23
SLQ-24
SLQ-26
SLQ-27 (Shortstop)
SLQ-28
SLQ-29
Low Cost EW SLQ 32 duplicate

<u>Noise Jammer</u>

ULQ-10
SLT-8
SLQ-12

<u>RF Decoys</u>

ICAD/RF
SLQ-13
ALQ-98/102
Spinner
Dipole (Randomlaced inflatable radar alt tgt. gen.)

EXHIBIT D (cont'd)

Tethered Balloon
Chaffroc (MK 84) + Launch Equipment
≥RBOC MK 33
Super RBOC (MK 36-?)
Stovepipe (stack chaff)
(SLE-1)
Sailwing

— MK 3.6
IR Decoys ___ MK 18T ___ ~~MIHELEX~~

NATO

SEA GNAT
SOID
Hydrocarbon Canister   PME 107-5   MR AL RITTER
Torch   MK 18b mod 0   K22231
BIRD (Balloon IR Decoy)
IRAD (Infrared Area Decoy)

Acoustic Silencing

Surface Ship

Prairie-Masker — 63R

Submarine

Machinery Silencing — 65H
Moisture Detector — 65H
Skewed Prop. — 65?
Damped Prop. — 65H
Target Strength Reduction — 65H
Anti-radiation Coating — 65H
Torpedo Tube Noise Red. — 5H

Cover and Deception

ADDs
Expendable
Recoverable
SQS Simulator   63R

ICAD
Towed Simulator
STADD

Surface Ship Defense

ETC-2 63R
NAE
5-In. Device
T-MK 6
SLQ-25 (NIXIE)

Submarine Defense

NAE MK 3 Mod 2
NAE MK 3 Mod 3   63R
ETC-1
Five Inch Evasion Device (FED) + Launchers

Mobile Sub Simul. (MOSS)

Adaptive Mobile Torpedo Decoy 63K

Low Freq. Tonal Masker

Multi-Freq. Spot Jammer

Broadband Jammer

<u>Weapons</u>

  <u>Missile FCS</u>

      <u>MK 74/0</u>

        /1

        /2

        /4

        /5

      <u>MK 76/1</u>

        /3-8

      <u>MK 77/0</u>

        /2

        /3

        /4

     <u>BPDSMS</u>

     <u>NSSMS</u>

     <u>IPDSMS</u>

     <u>MK 99</u>

  <u>Gun FCS</u>

     <u>MK 34</u>

     <u>MK 37</u>

     <u>MK 38</u>   62½

     <u>MK 51</u>

     <u>MK 52</u>

     <u>MK 54</u>

EXHIBIT D (cont'd)

GUN FES

MK 56 _____

MK 57 _____

MK 63/14 _____
/23, 24, 28, 29
n, 10, 11, 12

MK 67 _____

MK 68/15 _____
/3, 4, 6, 8, 11, 13
/9, 10
/12
/14

MK 68 Improved _____

MK 70 _____

MK 86/3 _____
/4
/5

MK 87 _____

MK 92/2 _____
/1

MK 94 _____

-Phalanx, MK 90/0 _____

Missile Launchers

MK 7/0 _____

MK 12/0 _____

MK 9/0 _____

MK 10/0 _____
10/1
10/2
10/3 & 4
10/5 & 6
10/7
10/8

EXHIBIT D (cont'd)

MK 11/0

MK 13/0
    13/1
    13/2
    13/3

MK 22

MK 26/0
    26/1
    26/2

MK 25/1

MK 29/0

ISSM Box

Harpoon Box

ASROC
    MK 112

Guns and Projectiles

20 mm
    MK 29
        Mach. Gun

    PHALANX CIWS
        20 mm

30 mm
    Ex 30
        Mach. Gun

40 mm
    MK 3 Mod. 4

3 in/50 cal
    MK 22
    MK 26
    MK 33/0
    MK 33/13
    MK 34/0
    MK 34/5

76 mm/62 cal
    MK 75 (OTO-Melara Compact)

5 in/38 cal (Twin)
    MK 24
    MK 30L
    MK 30H

MK 32   1024

MK 38   1024

5 in/54 cal.

    MK 42 Mod 7 (Hi frag)   —

    MK 42 Mod 9

    MK 45 Mod 0

8 in/55 cal   1024

    MK 71

Guided Missiles and Projectiles

    RIM-8G

    RIM-8J

    SM-1 (ER)   62232

        RIM-67A

    SM-2 (ER)   PMS   420

        RIM-67B

    SM-1A (MR)

        RIM-66A   62232

    SM-1 (MR)

        RIM 66B

    SM-2 (MR)   PMS-420

        RIM-66C

    BPDSMS

        Sea Sparrow   6224

        RIM-7

    NATO

        Sea Sparrow   6225

        RIM-7H

    5" Guided Proj. – Passive IR   6224C

    TALOS ARM

        RGM-8H

    SM-1 (ER)

        RIM-67A

    SM-2 (ER)

        RIM-67B

    SM-1 (MR)   622

        RIM-66B

    SM-2 (MR)

        RIM-66C

    STD-SSM

        Semi-Active

    STD-SSM-ARM

        RGM-66D-2

~~STO-SSA-Active~~
RGM-66F-1   AIR 氮

Harpoon
    RGM-84A (Ship)   AIR
    UGM-84 (Sub)

5" Guided Proj. S/A Laser

8" Guided Proj. S/A Laser

Underwater Transit Weapons

MK 37/0 ⌉
MK 37/1 ⎬ 63 Z 21
MK 37/2 ⎪
~~MK 37/3~~ ⌋
MK 44/1 - obsolete
MK 45/2
MK 46/2 - 63 Z 2
MK 46
        NEARTIP 63 Z 23

ALWT - ⟨...⟩
    (Adv. Lt. Wt. Torpedo

MK 48/1 ...

MK 48 Imp - ⟨...⟩

SUBROC 63 X 21

ASROC/NUC

ASROC/MK 46 ⎬ 63 x 2

~~B-57~~ AIR

LAND BASED SYSTEMS

Command and Control

    Integrated Command Support Center - 612

    Ocean Surveillance Intelligence System (OSIS) - 612

    ASW Command Control System (ASWCCS) 612

Communications

    Long Range Point to Point (RF)

        ELF
            Sanguine

        VLF
            Fleet Broadcast   ⟨...⟩
            FRT-3-87   10481.

        LF/MF
            Fleet Multichannel Broadcast ⟨...⟩

Satellite Network
    LES-6 (Lincoln Exp. Sat.)
    TACSAT-I
    DSCS Phase I
    DSCS Phase II
    GAPFILLER
    FLTSATCOM

} NAVELEX

Navigation Systems
    RAYDIST-T — 6132
    LORAN A — 6132
    LORAN C — 6132
    OMEGA — 6132
    TRANSIT (NAVSAT) — 6132
    NAVSTAR
        Global Positioning System (GPS) 6132

Mines — PMS-407

MK 25
    Mod 0

MK 52
    Mod 1
    Mod 2
    Mod 3
    Mod 4
    Mod 5
    Mod 6

MK 55
    Mod 1
    Mod 2
    Mod 3
    Mod 4
    Mod 5
    Mod 6
    Mod 7
    Mod 8

DST MK 36   MK36 is Navelex
    Mod 1
    Mod 2
    Mod 3
    Mod 4
    Mod 5

DST MK 40
    Mod 1
    Mod 2
    Mod 3
    Mod 4
    Mod 5

EXHIBIT D (cont'd)

Quickstrike   PMS-407

MK 61
    Mod 0 _____
    Mod 1 _____

MK 62
    Mod 0 _____

MK 63
    Mod 0 _____
    Mod 1 _____

MK 64
    Mod 0 _____
    Mod 1 _____

MK 65
    Mod 0 _____
    Mod 1 _____

MK 56
    Mod 0 _____

MK 57
    Mod 0 _____

CAPTOR   - PMS -407
(mk 60) _____

MK 53
    Mod 0 _____
    Sweep Obstructor _____

Mobile Mines

MK 27
    Mods 2, 4 _____
    Mods 3, 5 _____

MK 37 Torpedo Conversion - SLMM   PMS-407

PRAM (propelled ascent mine) _____

IWD. - Intermediate Water Depth Mine.

EXHIBIT D

CONTROL NO.						REPLY DUE BY	ASAP		

ORIGINATOR (Cmdr. and Extension where applicable)						SERIAL	DATE	SUBJECT CLASS.	CROSS REF.
ELEX 09F, OX23525/84									

ROUTE TO CODE	SYMBOL	RELEASED				SUBJECT
		INITIAL	MON.	DAY	YEAR	U.S. NAVY MATERIAL COMMAND/TECHNOLOGY TRANSFER ASSESSMENT

U.S. NAVY MATERIAL COMMAND/TECHNOLOGY TRANSFER ASSESSMENT

ENCLOSURE   SURVEY

SIGNATURE, EXT. CODE AND DATE ARE TO FOLLOW COMMENTS.
SYMBOLS: A - Action, C - Comment, I - Information, P - Prepare Reply, R - Retain Copy

system for which inclosed questionnaire is to be completed:

questionnaire ID#

A. J. Slaga

A. J. SLAGA

HEAD, INTERNATIONAL PROGRAMS

OFFICE

IF YOU HAVE ANY QUESTIONS ABOUT THIS QUESTIONNAIRE

ELEX 09FD

PLEASE CONTACT: GEORGE DRISCOLL, INTERNATIONAL

PROGRAMS OFFICE X23525/84

FILE —	UNLESS THIS MATERIAL IS TO BE FURTHER ROUTED RETURN TO FILE BY DATING AND INITIALING.	INITIAL	DATE

EXHIBIT E

1 FEB 1980

From: Chief of Naval Material

Subj: Technology Transfer Assessment Survey

1. The Export Administration Act of 1979 and OPNAVINST 5510.156 mandate that the control of design and manufacturing know-how, in addition to critical military end products of technology, is absolutely vital to the maintenance of U. S. technological superiority. In this regard, the Department of Defense has been urged to aid in maintaining the U. S. strategic technology lead by developing policy objectives and strategies for the export control of critical technologies.

2. In order to achieve this goal it is essential that critical technologies be systematically identified and assessed with regard to the necessity, feasibility, and method of export control to foreign countries. Toward this purpose, MAT 08D and the NRL Critical Technology Assessment Office, under my auspices, are conducting a TECHNOLOGY TRANSFER ASSESSMENT SURVEY.

3. Your contribution to this assessment is vital and will be greatly appreciated as the knowledge and judgment of your people is the major source of data for this study. As a participant you will be asked to respond to a SYSTEMS IDENTITY QUESTIONNAIRE AND DATA QUESTIONNAIRE which will be provided to a designated central point of contact within each command. It is envisioned that these central points of contact will distribute the questionnaire to each Program Manager within their Command.

4. The data your staff supplies will be computer analyzed by a pre-tested mathematical model, and the results will be integrated by panels of leading experts from government, industry, and academia. The final outcome of this process will be a Navy computer supported data-base, amenable to updating, which lists specific critical technologies, assesses optimal methods for the control of their exports, and provides a roster of cognizant technical experts.

5. Your support in the successful completion of this survey is strongly encouraged and I request that you designate your command point of contact to MAT 08D2 (Mr. J. Dunlavey, 692-3127/28) prior to 11 February 1980.

EDWARD J. OTH
Deputy Chief of Naval
Material (Acquisition)

Distribution:
(See page two)

EXHIBIT F

IN REPLY REFER TO
ELEX 09F:ats
Ser 43/09F

MEMORANDUM

From: ELEX 09F
To: Distribution

1 9 FEB 1980

Subj: U.S. Navy Material Command Technology Transfer
        Assessment Survey

Encl: (1) Questionnaire

1.   The NRL Critical Technology Assessment Office under
the auspices of RADM Edward J. Otth, Deputy Chief of
Naval Material (Acquisition) is now conducting the
Technology Transfer Assessment Survey as mandated by
the Export Administration Act of 1979 and OPNAV Instruction
5510.156. The purpose of this study is the assessment of
export control and identification of critical technologies
(see enclosure (1) for more information).

2.   You have been identified by this office as the individual
most knowledgeable about the subsystem named on the accompanying
route sheet. As such, you are receiving a copy of the
Technology Transfer Assessment Questionnaire (enclosure (1))
with this memorandum asking you about that subsystem. If you
have any questions about this questionnaire or assessment,
do not hesitate to contact Mr. George Driscoll, ELEX 09FD1,
692-3525/84, who is the designated ELEX point of contact.

3.   The success of this survey process hinges on your
expeditious completion and return of this questionnaire
to this office. The significance of your contribution
to this assessment cannot be overstated, and will be
greatly appreciated.

4.   Thank you for your time and effort.

RYAN L. HANSON
Head, International Programs
Office (Acting)

EXHIBIT G

- 62 -

U.S. NAVY MATERIAL COMMAND
TECHNOLOGY TRANSFER ASSESSMENT SURVEY

telephone record sheet · date: your initials:

For # on questionnaire (ask Respondent, appears on front of questionnaire and on route sheet):_____

Respondent's question or problem:

_____

_____

_____

_____

_____

_____

Action (check one): a. answered question or dealt with problem____
                    b. referred call to DATA SOLUTIONS   ____
                    c. referred call to Les Winslow   ____

Response given to respondent or action taken other than referal
to DATA SOLUTIONS or to Les Winslow:

_____

_____

_____

_____

_____

_____

_____

_____

| DATA SOLUTIONS: (703) 893-1360 | CRITICAL TECHNOLOGY OFFICE, NRL: |
| Kathy Losonczy or Rob Gould | (201) 767-2887 Les Winslow |

Telephone Sheet

EXHIBIT H

1.

NAVSEA - SYSTEMS LEVEL

Ship and Submarine Systems

QUEX ID #	NAVSEA CODE	SYSTEM NAME	DATE SENT	STATUS	DATE RECEIVED
Surveillance 0001	62x	SPS-29E			
0002	62x	SPS-32			
0003	62x	SPS-37A			
0004	62x	SPS-40B			
0005	62x	SPS-43A			
0006	62x	SPS-49			
0007	62x	SPS-58			
0008	62x	TAS Radar Auto			
3D Air Search 0009	62x	SPS-30A			
0010	62x	SPS-33			
0011	62x	SPS-39A			
0012	62x	SPS-42			
0013	62x	SPS-48A (V)			
0014	62x	SPS-48A (ATD)			
0015	62x	SPS-52			
0016	62x	SPS-52B			
0017	62x	SPS-52C			
0018	62x	SPY-1A (Aegis)			
Surface Search 0019	62x	SPS-10F			
0020	62x	SPS-55			
Submarine Search 0021	62x	BPS-5A-C			
0022	62x	BPS-9A			
0023	62x	BPS-9C			
0024	62x	BPS-12			
0025	62x	BPS-13			
0026	62x	BPS-14			
0027	62x	BPS-15			

EXHIBIT I

GUIDELINES FOR

CRITICAL TECHNOLOGY ASSESSMENT COMMITTEES

I. ADMINISTRATION

A. Fiscal

1. Committees are provided funding for their activities
    by the Navy Material Command via NRL Code 1404.
2. Legitimate committee expenditures include:
    a. copying
    b. computer search
    c. library information
    d. long distance calls
    e. travel arrangements and expenses
    f. time spent on committee function
3. Inquiries concerning the reimbursement of academic,
    industry, and others should be directed to the CTA
    Office.

B. Committee Membership Guides (Chair, Alternative, Technology
    Working Group Representative)

1. The Chair will select an alternate Chair to serve in
    his absence.
2. The Chair will select committee members. Criteria for
    selection includes balance of member backgrounds, train-
    ing, and representation of Navy systems and labs
    (uniformed military technical experts should be in-
    cluded where possible and appropriate), industry and

academia representation. Selection of committee members should be based not only on the breadth and depth of their knowledge of the technologies involved, but also on their ability to identify specialized experts in these areas. Also, in the case of system or subsystem committees, Chair should be cognizant of subcommittees in related areas so as to avoid redundancy of expertise in committee member selection.

3. Committee size at discretion of Chair, but not so large a group as to be unwieldy in terms of logistics, deliberation, and available resources.

4. Committee members should have security clearance on a par with the level dictated by the technology areas involved.

5. Names of alternate committee members (in instances of multiple nominations) should be held for future consideration as "validation committee" members.

C. Meeting Logistics

1. These are informal goals.

2. Frequency and duration of meetings is dependent on nature of task and time frame of committee goals and milestone, and this will be determined by the Chair.

3. Matters formally submitted should not necessarily represent the conclusions of a quorum of committee members or alternates (quorum=majority of members). A minority opinion is recommended.

4. Meetings should be located at office of Chair, or at any location which members agree will facilitate useful discussion. A conference room is available

in Room 211 of Building 33A.

5. Chair has responsibility for obtaining sufficient clerical personnel to adequately support the needs of meetings. This may include notes, recordings, secretarial assistance, meeting arrangements and notifications, copying, and other needs of this sort.

6. If secretarial services are unavailable, contact Shirley Cohee (x72887) for directions in obtaining aid.

D. Security

1. Classified and proprietary information acquired by committees and individual participants should be handled by established procedures within each office. This applies to hardcopy, transcripts, notes, voice recordings, and notes of conversations. The Chair of each committee is expected to determine that appropriate procedures are being followed, consistent with the particular needs of that committee's efforts. Comparable procedures for lending such information to others (other committees or expert panels used in evaluating a technology) should also follow established control processes to assure security of the information.

2. All formal queries coming from outside sources to committees should be directed to the CTA Office (such as from Congressional staffers, other agencies within Navy committees, DOD/IDA Working Group.

Within each committee a single point of contact
should be appointed to receive these queries
through the CTA Office. This, in most instances,
is likely to be the Chair.

II.   INFORMATION HANDLING

A.   Inputs to Committees

  1.   Chair is responsible for disseminating to committee
       members infor.aation that is to be provided from the
       CTA Office (this includes the CoCoM lists, the Navy
       Critical Technology Area List, the Critical Technology
       Assessment Survey Results, and various reports and
       instructions) and the timing of availability of these
       resources. For example, after potential items list
       (interim list of critical technologies) is submitted,
       CTA Office will send information to ONR and NISC for
       evaluations of availability of technologies to friendly
       foreign nations and potential adversaries, respectively,
       and these evaluations will be disseminated to committees
       in their deliberations regarding the "penultimate list"
       of critical technologies.
  2.   Strategies, formats, and timing for the solicitation of
       inputs from experts to committees is at the discretion
       of the Chair and committee members. Inputs may be
       solicited in the form of independent analyses and
       evaluations, or in the form of revised evaluations/
       critiques of committee analyses.
  3.   It is suggested that the Chair and committee members
       use the resources provided by the CTA Office (e.g. the
       Bucy Report) to establish a framework and guidelines
       for their efforts, tailoring the information provided
       as appropriate to the committees' area of concern.
  4.   Chair and committee members should be cognizant of
       lag time between request and delivery of information.

In this regard, letters soliciting points of contact for expert involvement or directly to experts should be sent as early as possible in the deliberation process.

5. Solicitation of technical expert contribution for technical information may be from Navy System Command, Navy laboratories, academia, industry, professional or trade associations. For funding purposes, it is preferable that they be currently involved in serving in Navy-related efforts.

6. Appropriate protocol should be followed in soliciting technical expert input; including agreement to serve from the individual and informing his superior (which may also involve a formal agreement). Security clearance for the individual need only be to the level appropriate to the technology area of concern.

7. Solicitation of agreement by an expert to appear on the "register of expert" list should follow appropriate formal protocol.

8. Input on task goals and milestones will be provided periodically by CTA Office.

B.   Inter-committee Interaction/Information Exchange

1. Chairs should share with other committee Chairs lists of technology area domains determined by their committees. Each committee should review and assess the relevancy of other committee domains to their own. The CTA Office will coordinate these reviews and determine where overlaps necessitate either domain alterations as opposed to necessary redundancy.

2. Committee members should feel free to exchange
   information to members of other committees as
   they deem appropriate. In this regard, all com-
   mittees should have periodically updated lists of
   current committee membership, phone numbers, and
   schedules. This may be coordinated through the
   CTA Office.

3. Other committees should be made aware of strategies
   being followed for both input to, and output from,
   committee deliberations.

4. When information is exchanged between committee
   Chairs, an information copy should be submitted to
   the CTA Office.

C. Outputs From Committees

1. Copies of notices of committee meetings, and a
   notation of attendees, should be forwarded to the
   CTA Office after each meeting.

2. Committees should submit preliminary lists of
   critical technologies and register of experts in
   such a manner as to make possible evaluation in
   regard to completeness and utility by the CTA
   Office.

3. Each committee is responsible for determining
   strategies for constructing preliminary lists and
   for validating those lists subsequent to further
   input. Committees may choose, for instance, to
   hold out a list of experts who will later serve
   as an independent review panel for the validation
   of the committees interim lists. Alternately, use

may be made of already existing advisory groups
to serve this purpose.

4. Nominees for the Register of Experts should be
transmitted to the CTA Office.

5. If committee members hold conflicting positions
concerning issues related to critical technology
assessment, these conflicts should be documented
(perhaps as majority and minority positions) in
output reports.

6. After the preliminary list of critical technologies
has been submitted, committees will receive the
results of the Critical Technology Assessment Sur-
vey. These results will be in the form of evaluations
of the criticality of Navy equipments at the system,
subsystem, and device level. Output reports from
committees should document the degree of utility
of these results and areas of agreement and disagree-
ment. The CTA Office will provide a format for
these evaluations, which provides a means for them
to be fed into the Navy critical technology database.

7. Provision of output information to TWGs should be
coordinated through the CTA Office. Over time the
CTA Office will provide guidance as to the format
of output reports to facilitate ease of review,
output sharing with other committees and integra-
tion of output with other souces (e.g. the Critical
Technology Assessment Survey database). One major
goal of this process will be to assist in the evolu-
tion of a common basis for categorizing technologies.
This common basis would transcend all disciplinary
boundaries, and serve as a foundation for future
assessment efforts.